

1.913
C 3H 75
Reserve

REPORT OF HOME-CANNING JAR-RING TESTING CONFERENCE
FOOD TECHNOLOGY LABORATORY
MASSACHUSETTS STATE COLLEGE, AMHERST, MASS.
MARCH 26 - 29 AND MAY 2 - 3, 1945

By MARY E. LOUGHEAD
Extension Specialist in Food Preservation

The primary purpose of the home-canning jar-ring testing conference was to bring together representatives of various Government agencies concerned with jar-ring quality and of the jar-ring industry to discuss matters of common interest pertaining to jar rings, examine samples of rings for certain tests, and to see what might be done to improve them further. The conference was held under the direction of the Containers and Packaging Branch, Office of Materials and Facilities, War Food Administration, at the request of the WFA and the jar-ring industry.

The following jar-ring and closure companies were represented by technical experts at the conference: Crown Cork and Seal Co., Baltimore, Md.; Home Canners Cap Corporation, New York, N. Y.; Boston Woven Hose and Rubber Co., Cambridge, Mass.; Hazel Atlas Glass Co., Washington, Pa.; Ball Brothers, Muncie, Ind.; Cupples Co., St. Louis, Mo.; U. S. Rubber Co., Passaic, N. J.

Representatives of Government agencies concerned with jar-ring quality included: Dr. W. B. Esselen, Jr., Massachusetts State College (representing the Containers and Packaging Branch, Office of Materials and Facilities); Dr. Edward C. Toepfer, food technologist, BHNHE; and Mary E. Loughead, Extension Service, USDA. Dr. Marion C. Pfund, Department of Home Economics, Cornell University, Ithaca, N. Y., and W. R. Cole, food technologist, Massachusetts State College attended the first meeting.

Proceedings of First Meeting (March 26-29):

The meeting was opened by Dr. Esselen, who served as chairman throughout the meeting, with some remarks regarding events which led to the calling of the conference, the purpose, and preliminary work on setting up tests for jar-ring quality. Following this, reports relative to jar-ring quality were given as follows: W. R. Cole -- survey of off-flavor in foods, imparted by jar rings, as reported in Massachusetts; Mary E. Loughead -- summary of reports of State extension food preservation specialists regarding off-flavors imparted by jar rings; Marion C. Pfund -- results of experimental work with 23 samples of jar rings to test for off-flavor imparted to apple juice and tomato juice; E. W. Toepfer -- results obtained from experimental work on jar rings carried out by the USDA.

These above reports indicated a difference of opinion as to extent of off-flavors in canned foods imparted by jar rings. The reports raised several questions for discussion. These included: Influence of reclaimed rubber, both the source of reclaim and method of processing, on odors and flavors of jar rings; effect of vacuum on off-flavor in canned products; effect of ascorbic acid content on flavor of canned food; extent to which screw-type lids with separate rubber rings should be "backed off" in closing jars before processing; effect of soda-water bath treatment on sealing quality of rings; relation of color of ring to off-odor and flavor.

After some discussion of these and various other questions, a standard test procedure for evaluating jar ring quality was agreed upon. Jar rings used in the test procedure were submitted by various companies in the industry. Twenty-six samples, representing top and shoulder seals, both black and red colors, were tested. Some of these were of 1944 stock, some 1945 production, and some experimental rings. A brief description of the test procedures follows:

1. Pretreatment of Jar Rings--Pretreat all rings prior to use by boiling in a solution of 1 tablespoonful baking soda and 1 quart of water per dozen rings for 10 minutes. Rinse rings thoroughly in boiling water.
2. Steam-Pressure Canner Test--The purpose of this test was to check sealing quality of rings submitted for sampling when the pressure-canner method of processing was used. To make the test, pint jars were filled with water, adjusted to $\frac{1}{2}$ inch headspace, fitted with the sample of ring to be tested, sealed, and processed 2 hours at 15 pounds pressure. (Each step in the process was kept uniform for all samples of rings.) Nine rings from each sample were checked by this method. After cooling 24 hours, the degree of vacuum in the jars was determined.
3. Open Kettle Canning--The purpose of this test was to check sealing quality of rings when the open-kettle method of canning is used. Pint jars were filled to overflowing with boiling water, sealed, and cooled overnight and checked for seal and vacuum.
4. Canned Applesauce for Flavor Tests--A large batch of applesauce, sufficient to fill all jars to be tested, was prepared. The sauce, boiling hot, was filled into jars, leaving $\frac{1}{4}$ inch headspace. The jars were partly sealed, processed 15 minutes in boiling-water bath, and the seal completed immediately after removing from canner. Tasting tests on the applesauce were made the next day after canning and at the next meeting after 1 month's storage at room temperature. It is planned to make another sampling after about 4 months in storage. Applesauce was chosen for the flavor test because it was most readily available and seemed to be one of the products reported most frequently as having off-flavor from jar rings.
5. Hardness of Jar Rings--Determined by Shore hardness tester.
6. Dilution Flavor and Titration Tests for Jar Ring Quality--These tests were worked out by Dr. Esselen and Mr. Karl Ford (Ball Bros.) prior to the conference. The test is described very briefly as follows:

Jars were filled with boiled tap water. Two jar rings of the sample to be tested were used, one on the jar and the other placed in the jar with the water. The jars were sealed and processed in the pressure cooker according to the standard procedure set up. A portion of the liquid in the jar was then transferred to a clean bottle. Serial dilutions of 0.1, 0.01, 0.001, and 0.0001 were made up of the remaining sample, using boiled tap water. These dilutions were arranged in a decreasing order of concentration, and tasting tests were made by those attending the conference, and by several well-qualified persons on the staff of the Food Technology Department. A record was kept of the concentration where off-flavor could be detected.

The dilution flavor test was based on the assumption that in order for a jar ring to impart an off-flavor to canned food, it must contain water-soluble odor and

flavor elements which can go into solution in the canned product. It is reasonable to assume that a ring must be capable of emitting a certain level or concentration of flavor before it could cause trouble in a canned food.

A second lot of the original solution was used to make titration tests using potassium permanganate as an oxidizing agent. This method of evaluating jar rings is an attempt to develop an objective method for measuring the tendency of jar rings to emit off-flavors. Many taste and flavor elements are readily oxidized. It appears then that the quality of jar rings might vary with their content of water-soluble material which can be readily oxidized by an appropriate oxidizing agent. As with the dilution flavor test, more work must be done before it can be definitely correlated with the tendency of jar rings to impart off-flavors to foods.

Proceedings of Second Meeting (May 2-3):

The purpose of the second meeting was to make taste tests on the applesauce canned with the different manufacturers' rings at the March meeting, after 1 month's storage. In addition, new samples of rings submitted were tested and the over-all question of jar-ring quality was discussed. The 26 samples of applesauce were tested for off-flavors by the group attending the meeting, as well as several qualified persons on the staff of the Food Technology Department. The tasters scored the sauce as: (1) Good (no off-flavor at all); (2) slightly off-flavor (a trace of off-flavor, but not objectionable); (3) inedible (bad--strong off-flavor).

On the basis of these tests, it was concluded that, with the exception of two samples, the jar rings available for the 1945 home canning season, as represented by the samples tested, appear to be very satisfactory and that they should not cause off-flavors in canned foods. In the samples of applesauce which had off-flavor from jar rings, the off-flavor was styrene-like in nature, which might have been caused by the type of synthetic rubber used. It was suggested that the entire industry use synthetic rubber from one source of known good quality.

The results of the applesauce flavor tests and additional data obtained at Massachusetts State College indicate that the potassium permanganate titration test for jar-ring flavor does not always correlate with the actual quality of the rings and at present cannot be recommended as a test procedure. With the dilution flavor test, it would appear that if the flavor of the rings cannot be detected above a dilution of 1/10 or 1/100, we can be quite sure that the ring is satisfactory; but, again, additional work needs to be done before definite conclusions can be reached.

Conclusions:

As a result of the two meetings held thus far on testing home-canning jar-rings, the following conclusions were drawn:

1. As represented by the jar-ring samples submitted for test, we can be assured that the rings available for home canning in 1945 are definitely superior to those available in 1943 and are a further improvement over those on the market in 1944, which gave but little trouble.
2. Some poor rings may get on the market or occur as old inventory. Every effort should be made to clean up this situation and remove poor rings from the market.
3. The jar-ring industry should do everything possible to see that no poor quality jar-rings are manufactured and placed on the market.

4. All jar-ring manufacturers should obtain their synthetic rubber from a common source of known quality.
5. Some top-seal rings should have a slightly wider flange in order to make sure that they will always make a good seal with all top-seal jars.
6. Both red and black jar rings were equally good. The color of a jar ring has no relation to its quality.
7. All the jar rings tested showed satisfactory sealing qualities.
8. All jar rings, in the cartons, have a characteristic odor, which does not necessarily have a bearing on off-flavors in foods.
9. The present recommended practice of boiling jar rings for 10 minutes in 1 quart of water and 1 tablespoonful of baking soda per dozen rings, followed by a boiling-water rinse should be continued. This pretreatment does not affect the sealing quality of the ring.
10. At least three definite classes of flavors may come from jar rings: (a) "Chemical," (b) bitter, and (c) rubbery.
11. Some of these flavors are volatile in nature and are dissipated when food or water containing them is aerated or exposed to the air for prolonged periods of time.
12. The new tests for evaluating jar-ring quality which were introduced at this meeting provide a means for obtaining a better knowledge of factors influencing the tendency of jar rings to impart an off-flavor to food. Such knowledge should be effective in paving the way for the production of improved jar rings both now and in the postwar years.
13. Homemakers are advised not to stretch rings to test them and not to reuse rings.